METHODS, APPARATUS, AND ARTICLES OF MANUFACTURE FOR CREATING THREE-DIMENSIONAL AND ANIMATED IMAGES WITH LENTICULAR AND ANAGLYPH VIEWING DEVICES

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to three-dimensional and animated images and, more particularly, to systems and methodology for creating such images on a home or office computer without the need of professional imaging services.

Description of Related Technology

[0002] An anaglyph image is a moving or still picture consisting of two slightly different perspectives of the same subject in contrasting colors that are superimposed on each other, producing a three-dimensional (3D) effect when viewed through two correspondingly colored filters, typically a red and a blue lens of 3D glasses. In other words, anaglyph imaging refers to those moving or still images that need to be viewed with 3D glasses to produce the 3D effect.

[0003] An animated image is a series of successive still images superimposed on each other that when view through a special lens (i.e., a lenticular sheet) and rotated about an axis, produce an animated sequence of the images. A 3D image may also be created by using a lenticular sheet, as opposed to 3D glasses.

[0004] Conventionally, such specialized imaging techniques required professional imaging services. Accordingly, the cost of producing a unique or customized animated or 3D device is prohibitive to an individual user. In addition, "fine tuning" of the desired image is out of the user's hands, having to depend upon the judgement of the outside professional service.

[0005] In view of the foregoing, there is a need in the art for systems and methodology that enable a user to create his or her own animated or 3D image by using only a desktop computer and conventional printer.

SUMMARY OF THE INVENTION

[0006] The present invention provides a system for producing a three-dimensional or an animated device includes a computer system and a lenticular assembly. The computer system may include a printer, a monitor, and a computer. Under operation by a user and enablement by accompanying computer code or software, the computer displays a preview window and a plurality of thumbnail windows on the monitor. The user then causes the computer to import an image to each of the thumbnail windows, for example, by dragging and dropping an image file with a mouse. The computer then generates a processed image based on the plurality of images in the thumbnail windows. At this time, the user may modify and adjust the images as desired. When the images are satisfactory, the user may then cause the computer to export the processed image to the printer to generate a print of the processed image. The lenticular assembly includes a lenticular sheet with an adhesive layer to which the user may then mount the print, thereby forming an animated or three-dimensional device.

[0007] One of the benefits of the present invention is that a user is able to create animated or three-dimensional devices without the need of professional imaging services, thereby saving the user time and expense while enable the user to modify and amend the images and devices as desired.

[0008] One of the features of the invention is that the user may select a creation mode, that is, animated, three-dimensional (3D), or anaglyph mode. This selection then causes the computer to display a corresponding mode window on the monitor in which the user may proceed with importing images.

[0009] According to another feature of the present invention, the adhesive layer of the lenticular assembly may include pressure-sensitive adhesive. Accordingly, a print may be repositioned on the lenticular sheet or replaced by another print if desired. To aid the user in mounting the print to the lenticular sheet, an alignment mark may be printed on the print for use in aligning the print with lenses of the lenticular sheet.

[0010] Additional aspects, features, and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] FIG. **1** is a perspective view of an exemplary computer system for creating three-dimensional (3D) and animated prints in accordance with the principles of the present invention;

[0012] FIG. **2** is a view of a computer window environment configured according to a preferred embodiment of the invention;

[0013] FIG. **3** is a flow chart of exemplary methodology for a user to follow to create 3D and animated prints and images of the invention;

[0014] FIG. **4** is a schematic view of a creation-mode window according to a preferred embodiment of the invention, particularly illustrating a 2-flip animation mode window;

[0015] FIG. **5** is a schematic view of a creation-mode window according to a preferred embodiment of the invention, particularly illustrating a 3-flip animation mode window;

[0016] FIG. **6** is a schematic view of a creation-mode window according to a preferred embodiment of the invention, particularly illustrating a 3D mode window;

[0017] FIG. **7** is a schematic view of a creation-mode window according to a preferred embodiment of the invention, particularly illustrating an anaglyph mode window;

[0018] FIG. **8** is a flow chart of exemplary methodology for creating animated prints in accordance with the present invention;

[0019] FIG. **9** is a view of an interlaced image created according to the invention;

[0020] FIG. **10** is a flow chart of exemplary methodology for creating an anaglyph print in accordance with the invention;

[0021] FIG. **11** is a plan view of a lenticular assembly configured in accordance with the invention;

[0022] FIG. **12** is a cross-sectional view of the lenticular assembly of the invention;

[0023] FIG. **13** is a perspective view of a print being mounted to a lenticular sheet in accordance with the invention;

[0024] FIG. **14** is a cross-sectional view of a 3D or animated printed mounted to a lenticular sheet according to a preferred embodiment of the invention;

[0025] FIG. **15** is a plan view of a lenticular sheet with an adhesive strip according to a preferred embodiment of the invention;

[0026] FIG. **16** is a perspective view of a frame including an animated device according to the present invention;

[0027] FIG. **17** is a perspective view of stereo viewing glasses for viewing anaglyph prints of the invention; and

[0028] FIG. **18** is a plan view of a calibration sheet for calibrating lenticular sheets of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0029] Referring more particularly to the drawings, an exemplary embodiment of a computer system for creating three-dimensional (3D) and animated images in accordance with the principles of the present invention is illustrated in FIG. **1** and indicated with reference numeral **100**. A user may utilize exemplary computer system **100** to create his or her own 3D and animated prints economically at home or office and without the need of professional image services.

[0030] Exemplary system **100** includes a computer **102** with a processor **104**, a monitor **106**, and a home or office printing machine such as a printer **108**. Interface devices such as a keyboard **110** and a mouse **112** allow a user to interact with the system. Instructions in the form of computer code may be downloaded into computer **102** via a compact disc read-only memory (CD-ROM) drive **114** or a floppy drive **116** for respectively receiving a complementary computer-readable storage medium such as a CD-ROM **118** or a floppy disc **120**. Alternatively, computer code may be downloaded into computer **102** through an Internet connection **122** as known in the art. In addition, computer **102** may include a hard disc **124** on which computer

code may be stored or "bundled." Peripherals such as a scanner **126** and a digital camera **128** may also be connected to the system. The plurality of computer-readable instructions cause the processor **104** to operate the system **100** in accordance with the methodology of the invention, which is discussed in detail below.

[0031] With additional reference to FIG. **2**, in accordance with an exemplary embodiment of the invention, a working screen **130** is displayed on the monitor **106**. The screen **130** includes a plurality of windows with which a user may create an animated or a 3D image. More particularly, a selection window **132** provides a number of creation-mode selections from which a user may chose. In the preferred embodiment shown, for example, tabs **134** are provided for a 2-flip animated mode, a 3-flip animated mode, a 3D mode, and an anaglyph mode.

[0032] With additional reference to FIG. **3**, when a user selects one of the creation modes (step **U50**) by, e.g., clicking on one of the tabs **134** with the mouse **112**, a tab-specific mode window **136** is activated. More specifically, if the 2-flip tab **134** is selected, then a 2-flip mode window **136** as shown in FIG. **4** is displayed; if the 3-flip tab **134** is selected, then a 3-flip mode window **136** as shown in FIG. **5** is displayed; if the 3D tab **134** is selected, then a 3D mode window **136** as shown in FIG. **6** is displayed; and if the anaglyph tab **134** is selected, then an anaglyph mode window **136** as shown in FIG. **7** is displayed.

[0033] Once the creation mode is selected, then a user may import images (step **U52**) to thumbnail windows **138** within the mode window **136**. For example, a user may activate a file-location browser window as known in the art (not shown) by clicking on an import button **140**. The user may then drag and drop an image from a file location on the hard drive **124** of the computer **102**. Alternatively, image files may be downloaded or imported from a remote source such as the Internet **122**, the scanner **126**, the digital camera **128**, or one of the drives **114** or **116**.

[0034] With additional reference to FIG. **8**, when an image has been imported into each of the thumbnail windows **138** (step **S50**), then the code causes the computer **102** to interlace the images (step **S52**) and to display a preview (step **S54**) of an interlaced image in a preview window **142** of the screen **130**. As known in the art, an interlaced image **143** is created by deleting horizontal rows of pixels from the images at regular intervals, and then superimposing the images together as shown in FIG. **9**. Accordingly, for 2-flip animation, one-half of the

interlaced image is from a first image, while the other half is from the second image. In general, the interlaced image is a processed image based on the imaged imported to the thumbnail windows **138**.

[0035] Upon previewing the interlaced image (step **U54**), the user may modify one or more of the images in the thumbnail windows **138** or adjust how the image fits in each thumbnail window **138** by utilizing radio buttons **144**. For example, a computer-determined best fit may be selected, or height or width adjustments may be selected. The image may also be flipped or rotated using appropriate menus on a menu bar **146** of the screen **130**.

[0036] If 2- or 3-flip mode is selected, a user may toggle (step **U56**) between the images for viewing in the preview window **142** by clicking a toggle button **148**. If clicked (step **S56**), a first image is displayed (step **S58**) in the preview window **142**. If clicked again (step **S60**), a subsequent image is displayed (step **S62**). A preview button **150** may be clicked to view the interlaced image again.

[0037] The user may then print (step **U58**) the interlaced image when satisfied by the preview. A print button **152** may be provided which, when activated (step **S64**), causes the computer **162** to export (step **S64**) the interlaced image to the printer **108**, thereby providing a print **154**. The interlaced image may also be saved (step **U60**), for which a save button **156** may be provided. A user may selected a desired print size with radio buttons **158**, for example, 8 inches by 10 inches or 5 inches by 7 inches. An alignment mark button **160** may be activated so that an alignment mark is printed on the print **154**, which is discussed below.

[0038] If 3D mode is selected, then up to five images may be imported into the thumbnail windows **138** of the mode window **136** as shown in FIG. **6**. For a proper 3D print, the imported images are preferably separated by about 5 degrees of rotation, as appreciated by those skilled in the art. For proper 3D prints, a resolution of 40 lines per inch (lpi) should be selected at resolution radio buttons **162**, while 30 lpi should be selected for proper flip animation. The user may export (step **U62**) to the anaglyph mode for preview and modification if desired.

[0039] If anaglyph mode is selected, import buttons **164** may be utilized to import images from the 2-flip mode or the 3D mode. Referencing FIG. **10**, when the images are in the

thumbnail windows **138** (step **S50**), then the computer **102** creates an anaglyph (step **S68**) including a right view and a left view each of a corresponding color (i.e., red and blue). A user may adjust an image convergence (step **U64**) of the anaglyph. This may be done by adjusting the vertical positioning of each view with adjustment buttons **166** and/or the horizontal position of the anaglyph within the preview window with an window adjustment scroll bar **168**. A zero button **170** may be provided to center the image horizontally. In addition, a color anaglyph button **172** may be selected to create a color anaglyph if desired by a user, as opposed to a black-and-white anaglyph, and a full-screen button **172** may be provided so that the preview may be viewed full screen on the monitor **106**.

[0040] If 2-flip, 3-flip, or 3D mode is selected, the resultant print **154** may then be mounted (step **U66**) for proper viewing by utilizing a lenticular assembly **180** as illustrated in FIGS. **11** and **12**. Exemplary lenticular assembly **180** includes a lenticular sheet **182** with an adhesive layer **184** and a removable backing sheet **186**. A user may peel away the backing sheet **186** to expose the adhesive layer **184**. The print **154** may then be mounted to the lenticular sheet **182** by positioning the print **154** against the adhesive layer **184**, thereby adhering the print to the adhesive. As mentioned above and as shown in FIG. **13**, an alignment mark **192** may be printed on the print **154** to aid the user in aligning the interlaced image of the print **154** with the lenses **188** of the lenticular sheet **182**. A flip animated device **194** as shown in FIG. **14** results.

[0041] As shown in FIG. **15**, the adhesive layer **184** may be in the form of a strip along one of the sides of the lenticular sheet **182**. As shown in FIG. **16**, a user may then mount the animated device **194** within a frame **195** for display and for holding the print **154** flat against the lenticular sheet **182**. According to a preferred embodiment, the adhesive layer **184** may include pressure-sensitive adhesive so that the print **154** may be removed from the lenticular sheet **182** and repositioned thereon or, alternatively, replaced with another print if desired.

[0042] If the print **154** contains an anaglyph image, then the user may utilize stereo viewing glasses **196** as shown in FIG. **17** to view the image (step **U68**).

[0043] Referencing FIG. **1**, if desired a user may add an overlay to the print **154** by utilizing an overlay button **198**. An overlay may be an imported file for framing the image within the

print **154**. Alternatively, an overlay may be a logo printed on the print. In any case, the overlay is an image file that is not processed in creating the interlaced or anaglyph image.

[0044] In addition, the viewing distance may be adjusted by activating an adjust viewing distance button **200**. The viewing distance is the distance a user views the animated or 3D device **194**. If the viewing distance is not correct, the images may not have proper rolling animation or may ghost.

[0045] According to a preferred commercial embodiment of the invention, a kit including materials for producing animated and 3D devices may be provided. The kit may include one or more lenticular assemblies **180** (of varying resolution, e.g., 30 lpi and 40 lpi) and a pair of the stereo viewing glasses **196**. In addition, the kit may include software code in the form of a plurality of computer readable instructions stored on a data storage medium, such as a CD-ROM **118** or a flopping disc **120**. As mentioned above, the kit may include a web address so that the software code may be downloaded from a web site on the Internet. The kit may also include a calibration sheet **202** as shown in FIG. **18** that may be used to calibrate the lenticular sheets **182**.

[0046] Those skilled in the art will understand that the preceding exemplary embodiments of the present invention provide the foundation for numerous alternatives and modifications thereto. These other modifications are also within the scope of the present invention such that the present invention is not limited to that precisely as shown and described in the present invention.